MS Word Exhibit 300 for DME/Mixed (BY2008) (Form) / ARC Shared Capability Asset Program (SCAP) HECC MPIT (Item)

Form Report, printed by: System Administrator, **Jan 31, 2007**

OVERVIEW

General Information	
1. Date of Submission:	January 31, 2007
2. Agency:	026
3. Bureau:	00
4. Name of this Capital Asset:	ARC Shared Capability Asset Program (SCAP) HECC MPIT
Investment Portfolio:	BY OMB 300 Items
5. Unique ID:	026-00-01-02-01-1124-00
(For IT investments only, see section 53. For all other, use agency ID system.)	

All investments

6. What kind of investment will this be in FY2008?

(Please NOTE: Investments moving to O&M ONLY in FY2008, with Planning/Acquisition activities prior to FY2008 should not select O&M. These investments should indicate their current status.)

Mixed Life Cycle

7. What was the first budget year this investment was submitted to OMB?

FY2004

8. Provide a brief summary and justification for this investment, including a brief description of how this closes in part or in whole an identified agency performance gap.

The NASA High End Computing Columbia (HECC) Project provides an integrated environment that includes high-speed access to cutting edge High End Computing (HEC) platforms, assistance with application porting and scaling, data storage, pre- and post-processing support, visualization, training and online and help desk support. These features are enabling a factor of 10-100 advances in vehicle, earth, space, and life sciences modeling, and allow NASA's scientific users to do more rapid, cost-effective R&D.
The HECC Program is enabling a factor of 10-100 advances in vehicle, earth, space and life sciences modeling. which closes, in part, an identified agency performance gap. This is being made possible through a ten-fold increase in the capability and capacity of the computing, storage, and networking infrastructure, support for porting codes to these faster systems, scaling applications to utilize tens or hundreds of processors on a single execution, code restructuring to improve performance, and enhancement for visualization. To achieve these objectives, NASA must:

* Design and develop advanced aerospace systems;
* Develop an in-depth understanding of Earth, planetary, solar, and deep-space systems; and
* Ensure the safe and effective human presence in a broad range of space environments.

These tasks have in common the need to rapidly develop in-depth and quantitative understanding of complex systems (engineering, physical, and biological systems, respectively). When physical experimentation is not possible, the burden falls on theoretical analysis. The theory governing these processes often involve coupled non-linear partial differential equations requiring trillions of computations for solution; and the time constraints of ongoing development activities (e.g., vehicle design) mean the results are often needed in hours or, at most, days. To deliver the benefit of such computational modeling and simulation, it is essential to have a high-performance computing and communications system tailored to meet the specific requirements of the NASA community. This system must include sufficient and appropriate computing and communication assets, as well as the software to support the porting, optimization, and execution of the application and the post-processing of the computational results. In December 2005, the strategic council chose to incorporate the HECC Project as a part of SCAP, recognizing its priority in NASA's ongoing technology investment.

9. Did the Agency's Executive/Investment Committee approve this request?

Yes

9.a. If "yes," what was the date of this approval?

Oct 26, 2005

10. Did the Project Manager review this Exhibit?

Yes

12. Has the agency developed and/or promoted cost effective, energy-efficient and environmentally sustainable techniques or practices for this project.

Yes

12.a. Will this investment include electronic assets (including computers)?

Yes

12.b. Is this investment for new construction or major retrofit of a Federal building or facility? (answer applicable to non-IT assets only)

No

12.b.1. If "yes," is an ESPC or UESC being used to help fund this investment?

12.b.2. If "yes," will this investment meet sustainable design principles?

12.b.3. If "yes," is it designed to be 30% more energy efficient than relevant code?

13. Does this investment support one of the PMA initiatives?

Yes

If "yes," select the initiatives that apply:

Human Capital	
Budget Performance Integration	
Financial Performance	
Expanded E-Government	
Competitive Sourcing	
Faith Based and Community	
Real Property Asset Management	
Eliminating Improper Payments	
Privatization of Military Housing	
R and D Investment Criteria	Yes
Housing and Urban Development Management and Performance	
Broadening Health Insurance Coverage through State Initiatives	
Right Sized Overseas Presence	
Coordination of VA and DoD Programs and Systems	

13.a. Briefly describe how this asset directly supports the identified initiative(s)?

The NASA High End Computing Columbia (HECC) Project provides an integrated environment that includes high-speed access to cutting edge High End Computing (HEC) platforms, assistance with application porting and scaling, data storage, pre- and post-processing support, visualization, training and online and help desk support. These features and capabilities help the project's users do more cost-effective R&D.

14. Does this investment support a program assessed using OMB's Program Assessment Rating Tool (PART)?

Yes

14.a. If "yes," does this investment address a weakness found during the PART review?

No

14.b. If "yes," what is the name of the PART program assessed by OMB's Program Assessment Rating Tool?

Solar System Exploration

14.c. If "yes," what PART rating did it receive?

Effective

15. Is this investment for information technology (See section 53 for definition)?

Yes

For information technology investments only:

16. What is the level of the IT Project (per CIO Council's PM Guidance)?

Level 2

17. What project management qualifications does the Project Manager have? (per CIO Council's PM Guidance)

(1) Project manager has been validated as qualified for this investment

18. Is this investment identified as "high risk" on the Q4 - FY 2006 agency high risk report (per OMB's 'high risk" memo)?

No

19. Is this a financial management system?

No

19.a. If "yes," does this investment address a FFMIA compliance area?

19.a.1. If "yes," which compliance area:

Not Applicable

19.a.2. If "no," what does it address?

Not Applicable

19.b. If "yes," please identify the system name(s) and system acronym(s) as reported in the most recent financial systems inventory update required by Circular A–11 section 52.

20. What is the percentage breakout for the total FY2008 funding request for the following? (This should total 100%)

Area	Percentage	
Hardware	35.00	
Software	8.00	
Services	42.00	
Other	15.00	
Total	100.00	

21. If this project produces information dissemination products for the public, are these products published to the Internet in conformance with OMB Memorandum 05-04 and included in your agency inventory, schedules and priorities?

Yes

22. Contact information of individual responsible for privacy related questions

Name	Arsi Vaziri

Phone Number	(650)604-4523
Title	Computer Security Officer
Email	Arsi.Vaziri@nasa.gov

23. Are the records produced by this investment appropriately scheduled with the National Archives and Records Administration's approval?

Yes

SUMMARY OF FUNDING

SUMMARY OF SPENDING FOR PROJECT PHASES (In Millions)

1. Provide the total estimated life-cycle cost for this investment by completing the following table. All amounts represent budget authority in millions, and are rounded to three decimal places. Federal personnel costs should be included only in the row designated "Government FTE Cost," and should be excluded from the amounts shown for "Planning," "Full Acquisition," and "Operation/Maintenance." The total estimated annual cost of the investment is the sum of costs for "Planning," "Full Acquisition," and "Operation/Maintenance." For Federal buildings and facilities, life-cycle costs should include long term energy, environmental, decommissioning, and/or restoration costs. The costs associated with the entire life-cycle of the investment should be included in this report.

All amounts represent Budget Authority

(Estimates for BY+1 and beyond are for planning purposes only and do not represent budget decisions)

	PY	CY	BY
	2006	**2007**	**2008**
Planning:	0.000	0.000	0.000
Acquisition:	21.549	25.795	23.284
Subtotal Planning & Acquisition:	21.549	25.795	23.284
Operations & Maintenance:	10.336	7.082	11.330
TOTAL	31.885	32.877	34.614
Government FTE Costs	5.897	6.111	6.325
# of FTEs	29.2	29.2	29.2
Total, BR + FTE Cost	37.782	38.988	40.939

Note: For the cross-agency investments, this table should include all funding (both managing partner and partner agencies).

Government FTE Costs should not be included as part of the TOTAL represented.

2. Will this project require the agency to hire additional FTE's?

No

2.a. If "yes," how many and in what year?

3. If the summary of spending has changed from the FY2007 President's budget request, briefly explain those changes.

Center G&A and pooled costs are no longer budgeted under the HECC Program.

*Budget Comments * Internal Use Only**

Other variations reflect minor budget tweaks and the effect of inflation.

PERFORMANCE

Performance Information

In order to successfully address this area of the exhibit 300, performance goals must be provided for the agency and be linked to the annual performance plan. The investment must discuss the agency's mission and strategic goals, and performance measures must be provided. These goals need to map to the gap in the agency's strategic goals and objectives this investment is designed to fill. They are the internal and external performance benefits this investment is expected to deliver to the agency (e.g., improve efficiency by 60 percent, increase citizen participation by 300 percent a year to achieve an overall citizen participation rate of 75 percent by FY 2xxx, etc.). The goals must be clearly measurable investment outcomes, and if applicable, investment outputs. They do not include the completion date of the module, milestones, or investment, or general goals, such as, significant, better, improved that do not have a quantitative or qualitative measure.

Agencies must use Table 1 below for reporting performance goals and measures for all non-IT investments and for existing IT investments that were initiated prior to FY 2005. The table can be extended to include measures for years beyond FY 2006.

Table 1

	Fiscal Year	Strategic Goal(s) Supported	Performance Measure	Actual/baseline (from Previous Year)	Planned Performance Metric (Target)	Performance Metric Results (Actual)
1	2004	This investment supports the following NASA Strategic goals: #1, #2, #8 and #10. For detail descriptions, please refer to NASA's Strategic Plan.	Expand system and scale application to 128 Altix Processors	64 Processors per application	Number of processors per application	512 Processors per application
2	2004	This investment supports the following NASA Strategic goals: #1, #2, #8 and #10. For detail descriptions, please refer to NASA's Strategic Plan.	Install new 128 processor system in three weeks.	Install new 128 processor systems in one month time period.	Improve processor installation time to production	Installation time to production achieved in one week for Return to Flight.
3	2004	This investment supports the following NASA Strategic goals: #1, #2, #8 and #10. For detail descriptions, please refer to NASA's Strategic Plan.	Reduced time to solution for Earth Science – ECCO code (Estimating Circulation and Chemistry of the Ocean) by 50%, i.e., to 4.5 months of compute time for a decade ocean current simulation with one quarter degree of resolution.	For Earth Science – ECCO code (Estimating Circulation and Chemistry of the Ocean) requires nine months of compute time for a decade ocean current simulation with one quarter degree of resolution.	Decrease time to solution for Circulation and Chemistry (ECCO) application	Factor of 33 in time to solution.
4	2004	This investment supports the following NASA Strategic goals: #1, #2, #8 and #10. For detail descriptions, please refer to NASA's Strategic Plan.	Increase resolution to one-sixth of one degree or by a factor of 2.25.	Resolution of ECCO simulation one-quarter of one degree.	Fidelity or resolution of ECCO (Estimating Circulation and Chemistry of the Ocean) simulation	Met metric and improved fidelity by a factor of 2.25.
5	2004	This investment supports the following NASA Strategic goals: #1, #2, #8 and #10. For detail descriptions, please refer to NASA's Strategic Plan.	Maintain 50%	50%	Total System Utilization: for 512 processor system. (New technology systems with 512 processors are less reliable and have greater overhead. Expected system utilization is 50% or more.)	50%

6	2004	This investment supports the following NASA Strategic goals: #1, #2, #8 and #10. For detail descriptions, please refer to NASA's Strategic Plan.	Maintain 65%	65%	Total System Utilization: for 256 processor system. (Mature or smaller configurations have higher reliability and more efficient scheduling with smaller applications. Expected system utilization is 65% or greater.)	65%
7	2004	This investment supports the following NASA Strategic goals: #1, #2, #8 and #10. For detail descriptions, please refer to NASA's Strategic Plan.	Achieve a 2x scaling: Code scales and runs on 128 processors	ECCO simulation runs on 64 processors.	Code scaling on ECCO to increase processors	Code scaled and runs on 256 processors. A factor of 4 improvement.
8	2004	This investment supports the following NASA Strategic goals: #1, #2, #8 and #10. For detail descriptions, please refer to NASA's Strategic Plan.	Factor of 2x speed up in performance for Overflow in support for RTF on 16 processor Altix.	NASA CFD code Overflow running 35M point airplane 16 CPU Origin.	Speed of performance for overflow in support for RTF on 16 processor Altix	Achieved 4x improvement
9	2004	This investment supports the following NASA Strategic goals: #1, #2, #8 and #10. For detail descriptions, please refer to NASA's Strategic Plan.	Factor of 2x speed up in performance for Phantom in support for RTF on 64 processor Altix.	NASA CFD code Phantom running on 64 CPU Origin.	Speed of performance for overflow in support for RTF on 64 processor Altix	Achieved 4x improvement
10	2005	This investment supports the following NASA Strategic goals: #1, #2, #8 and #10. For detail descriptions, please refer to NASA's Strategic Plan.	Maintain 50%	50%	Total System Utilization: for 512 processor system. (New technology systems with 512 processors are less reliable and have greater overhead. Expected system utilization is 50% or more.)	Exceeds 50%
11	2005	This investment supports the following NASA Strategic goals: #1, #2, #8 and #10. For detail descriptions, please refer to NASA's Strategic Plan.	Maintain 65%	65%	Total System Utilization: for 256 processor system. (Mature or smaller configurations have higher reliability and more efficient scheduling with smaller applications. Expected system utilization is 65% or greater.)	This metric is not applicable. It was not necessary to build a 256-processor system as a precursor to the 512.
12	2006	This investment supports the following NASA Strategic goals: #1, #2, #8 and #10. For detail descriptions, please refer to NASA's Strategic Plan.	Maintain 50%	50%	Total System Utilization: for 512 processor system. (New technology systems with 512 processors are less reliable and have greater overhead. Expected system utilization is 50% or more.)	As of June 2006, total system utilization average was 75%.
13	2006	This investment supports the following NASA Strategic goals: #1, #2, #8 and #10. For detail descriptions, please refer to NASA's Strategic Plan.	Maintain 65%	65%	Total System Utilization: for 256 processor system. (Mature or smaller configurations have higher reliability and more efficient scheduling with smaller applications. Expected system utilization is 65% or greater.)	Exceeded 65%. It was not necessary to build a 256-processor system as a recursor to the 512. This metric is not applicable.

All new IT investments initiated for FY 2005 and beyond must use Table 2 and are required to use the FEA Performance Reference Model (PRM). Please use Table 2 and the PRM to identify the performance information pertaining to this major IT investment. Map all Measurement Indicators to the corresponding "Measurement Area" and "Measurement Grouping" identified in the PRM. There should be at least one Measurement Indicator for at least four different Measurement Areas (for each fiscal year). The PRM is available at www.egov.gov.

Table 2

	Fiscal Year	Measurement Area	Measurement Category	Measurement Grouping	Measurement Indicator	Baseline	Planned Improvements to the Baseline	Actual Results
1	2005	Mission and Business Results	Education	Higher Education	Higher Education - Intern and Post Doctorate Opportunities	30	Maintain 30	Exceeds 30. The number of interns and post-doctoral visitors at the NAS Facility, together with students from academic institutions that receive allocations on Columbia significantly exceeds 30.
2	2006	Mission and Business Results	Education	Higher Education	Higher Education - Intern and Post Doctorate Opportunities	30	Maintain 30	Exceeds 30. The number of interns and post-doctoral visitors at the NAS Facility, together with students from academic institutions that receive allocations on Columbia significantly exceeds 30.
3	2007	Technology	Reliability and Availability	Availability	System Utilization	More than 75% of Mission Directorate allotments	Maintain 75% of Mission Directorate allotments during this transition year as the Columbia supercomputer is being upgraded.	TBD.
4	2005	Mission and Business Results	General Science and Innovation	Scientific and Technological Research and Innovation	Scientific and Technology - Advances in Single System Images Technology	512 Processors on a single problem – Currently, the largest Linux Single System Image computer is 512 processors. Increases in this capability allows for easier scaling enabling greater scientific discovery.	2,048 Processors on a single problem	ECCO executes on 2,048 CPUs. The Estimating the Circulation and Climate of the Ocean (ECCO) application aims to produce optimal syntheses of global-scale oceanic data over several decades. A key discovery involves prediction of hurricane activity.

5	2005	Mission and Business Results	General Science and Innovation	Scientific and Technological Research and Innovation	Application porting and scaling	Report porting and scaling for project areas. HECC will identify the heaviest used applications and work with the scientists and engineers to move them effectively into this new environment.	Report porting and scaling for project areas	Over 20 codes across NASA Mission Directorates have been ported and scaled in 2005 (ARMD 6, ESMD 9, SMD 14, SOMD 6, Other 5). Multiple benchmarking and scaling studies have also been conducted to assist performance enhancements.
6	2006	Mission and Business Results	General Science and Innovation	Scientific and Technological Research and Innovation	Application porting and scaling	Report porting and scaling for project areas. HECC will identify the heaviest used applications and work with the scientists and engineers to move them effectively into this new environment.	Report porting and scaling for project areas	A report for porting and scaling is under preparation. Assisted in the porting and scaling of more than 28 codes. Multiple, ongoing benchmarking and scaling studies are being conducted to assist performance enhancements and architecture evaluation.
7								
8	2005	Processes and Activities	Productivity and Efficiency	Productivity	Application Performance Enhancements	4 enhancements to major applications per year. Enhancements to ECCO code enabled simulations not possible on past systems. Other areas include climate modeling, turbopump, nanotechnology, digital human, full mission simulation, solar modeling.	20 enhancement to major NASA applications per year	Achieved 20 significant performance enhancements for a range of codes (by Mission Directorate): ARMD 2, ESMD 4, SMD 6, SOMD 6, Other 2. For example, achieved a 10x speedup for 3D/Grape.
9	2006	Processes and Activities	Productivity and Efficiency	Efficiency	Application Performance and Productivity Enhancements	4 enhancements to major applications per year. HECC will identify the most important applications and work with scientists and engineers to enhance overall productivity, including improving the scalability and performance of the codes.	20 enhancements to major NASA applications per year	Achieved significant productivity enhancements for more than 18 codes.
10	2007	Processes and Activities	Productivity and Efficiency	Efficiency	System Performance	Current system cost/performance	Demonstrate system cost/performance enhancement of "Columbia Follow On" (CFO).	TBD

11	2005	Processes and Activities	Productivity and Efficiency	Productivity	System Development - Factor 1 – Cluster Management of 10,240 Processors	512-CPU Linux SSI; currently the largest Linux system is 512 CPUs, limitimg the size of exploration achievable. A fat-node cluster of 10240 CPUs with node size from 512 CPUs to 2048 CPUs all connected by high speed internodal communication fabric.	10,240 Processor fat-node cluster	The Columbia system was operational in October 2004 as a 10,240 processor fat-node cluster.
12	2005	Processes and Activities	Productivity and Efficiency	Efficiency	System Development - Factor 2 – Cluster management of a 2,048 Processor	Cluster management of 512-CPU Linux SSI; currently the largest Linux system is 512 CPUs, limiting the amount of physics performed in a tightly coupled simulation. Increasing capability enlarges the complexity and accuracy of simulations.	Cluster management of a 2,048 Linux Cluster Single System Image (all processors on one application)	A 2,048 Linux Shared-Memory Cluster has been operational since November 2004.
13	2005	Technology	Reliability and Availability	Availability	System Maintenance - Factor 1 - MTBF (Mean Time Between Failures)	New System (no baseline) – This is a proposal for a new system that currently has no established MTBF. Historically, excellent performance obtained on systems like the Cray C90 were in the 14 day MTBF range.	14 Days MTBF on 512 Processor Systems	As of 8/8/2005, the MTBF on 512 processor systems in the current quarter is 17.2 days, meeting the required standard.
14	2005	Technology	Financial (Technology)	Operations and Maintenance Costs	IT Infrastructure Maintenance – Cost per CPU Hour	96¢ SGI Origin 3000 with 400 Mhz Clock. The HECC full cost for the current systems were 96¢ per normalized hour. This proposal targets significantly reducing cost while greatly increasing the capability available.	Reduce cost by a factor of 5	In May 2005, the cost per normalized CPU-hour was reduced by a factor of 11.7, more than double the standard.

15	2005	Processes and Activities	Security and Privacy	Security	IT Security - Compliance with NASA Security Policies	Maintain 100% compliance with security policies - The HECC is fully compliant with the NASA security policies. This is a key component for a HEC center and HECC will continue to improve on its security.	Maintain 100% compliance with security policies	A security plan is in place. It was reviewed by the Ames CIO and, on 08/11/2005 it was certified "100% compliant with NASA security policies".
16	2006	Processes and Activities	Security and Privacy	Security	IT Security - Compliance with NASA Security Policies	Maintain 100% compliance with security policies	Maintain 100% compliance with security policies	A security plan is in place. It was reviewed by the Ames CIO and, on 08/11/2005 it was certified "100% compliant with NASA security policies". The new Columbia Enclave Security Plan was reviewed and certified on April 13, 2006.
17	2007	Mission and Business Results	Information and Technology Management	Information Systems Security	Security Policies, Plans, and Implementation	Maintain 100% compliance with security policies, maintaining system and facility security plans, support rapid response to Security Audits and Incidents.	Continue to maintain 100% compliance with security policies, update system and facility security plans, and maintain 24-hour response capability and timely solution to security incidents.	TBD
18	2005	Processes and Activities	Security and Privacy	Security	IT Security - Provide Security Plans	Maintain 100% compliance with generating and maintaining system and facility security plans - The HECC is maintaining their plans in accordance with NASA policy and also maintaining cognizance of plans and policies implemented at other HEC centers.	Maintain 100% compliance with generating and maintaining system and facility security plans	A security plan is in place. It was reviewed by the Ames CIO and, on 08/11/2005, it was certified "100% compliant with generating and maintaining system and facility security plans".

19	2006	Processes and Activities	Security and Privacy	Security	IT Security - Provide Security Plans	Maintain 100% compliance with generating and maintaining system and facility security plans	Maintain 100% compliance with generating and maintaining system and facility security plans	The new Moderate Sensitivity "Columbia Enclave Security Plan" is in place. It was reviewed by the Ames CIO and was certified "100% compliant with NASA Moderate sensitivity security policies". The Columbia Enclave Security Plan successfully passed the NIST-compliant Certification and Accreditation process on April 13, 2006.
20	2005	Processes and Activities	Security and Privacy	Security	IT Sec - Rapid response to Security Audits & Incidents	24x7 response & timely solution to security incidents. HECC has a dedicated security team that immediately responds to all suspected and actual security incidents. Response includes coordinating and escalating to appropriate investigative bodies.	24 Hour response & timely solution to security incidents	HECC currently supports 24-hour response to security-related issues. It has been able to provide timely solution to security incidents in 2005.
21	2006	Processes and Activities	Security and Privacy	Security	IT Security - Rapid response to Security Audits & Incidents	24 Hour response & timely solution to security incidents	24 Hour response & timely solution to security incidents	HECC currently supports 24-hour response to security-related issues. It has been able to provide timely solution to security incidents in 2006.
22	2005	Mission and Business Results	General Science and Innovation	Scientific and Technological Research and Innovation	Enable new Science and Simulation	Facilitate discovery of one new science or simulation discovery/year. HECC has enabled scientific discovery by deploying vital computerl resources and teaming scientists and engineers to focus on advancs in specific science areas.	Facilitate the discovery of four new science or simulation discovery per year	Facilitated 6 new science/engineering results in these areas: storm simulation; supernovae physics; convection & magnetic fields in giant planets; LISA modeling; CART3D; flow in liquid rocket engine pump
23	2006	Mission and Business Results	General Science and Innovation	Scientific and Technological Research and Innovation	Enable new Science and Simulation	Facilitate discovery of one new science or simulation discovery/year. HECC has enabled scientific discovery by deploying vital computerl resources and teaming scientists and engineers to focus on advancs in specific science areas.	Facilitate four new science or engineering breakthroughs per year.	Facilitated 4 new science/engineering results in these areas: Science Mission Directorate: gravity wave simulation; Exploration Systems: CLV Aero simulations; Space Operations: shuttle redesign/debris transport; Space Operations: aerothermal analysis

24	2007	Mission and Business Results	General Science and Innovation	Scientific and Technological Research and Innovation	Ability to support high-end computing requirements needed to accomplish NASA's strategic goals #1, #3 and #4.	Current ability to meet prioritized computing demand on Columbia in support of NASA's strategic goals #1, #3 and #4.	Continue to meet prioritized computing demand on Columbia in support of NASA's strategic goals #1, #3 and #4 during this transition year.	TBD
25	2005	Customer Results	Customer Benefit	Customer Satisfaction	New Customer & Market Penetration – Major Development & Engineering Efforts	3 major development & engineering projects/year. HECC engineers work with science/engineering user communities on codes for scaling and with designers to improve scaling efficiency on targeted platforms.	20 major development and engineering projects per year	107 projects representing 3 of 4 Mission Directorates and Safety and Mission Assurance. 8 projects were awarded more than 1M hours, including nuclear flow simulations in supernovae; launch safety damage assessment; and tailored high-lift systems.
26	2006	Customer Results	Customer Benefit	Customer Satisfaction	New Customer & Market Penetration – Major Development & Engineering Efforts	Three major development and engineering projects per year	20 major development and engineering projects per year	57 new projects representing all Mission Directorates and Safety and Mission Assurance were awarded more than 1M hours, including: ARMD (9); ESMD (13); NESC (1); SMD (26); SOMD (3); NLCS & others (5)
27	2007	Customer Results	Customer Benefit	Customer Satisfaction	Number of new development and engineering projects on Columbia.	Number of new development and engineering projects on Columbia in FY06.	5% increase in the number of new development and engineering projects on Columbia.	TBD
28	2005	Customer Results	Customer Benefit	Customer Impact or Burden	Customer Impact - Time to Solution	Application Dependent – time to solution (TTS) is critical to meet NASA's science and engineering missions. Improving TTS while dramatically increasing simulation fidelity will result in improved science, better engineering and improved safety.	Factor of 2 improvement in time to solution	Factor of 15 or better. Time-to-solution for RTF Aerothermal analysis performance improvement: single solution reduced from 3 weeks to one day; ran more than 100 solutions in a 24 hour period.

29	2006	Customer Results	Customer Benefit	Customer Impact or Burden	Customer Impact - Time to Solution	Application Dependent – time to solution (TTS) is critical to meet NASA's science and engineering missions. Improving TTS while dramatically increasing simulation fidelity will result in improved science, better engineering and improved safety.	Achieve time-to-solution improvement goals as established jointly with the science/engineering teams.	An example involves 3.75 X improvement in USM3D unstructured Navier-Stokes flow solver to support CEV/CLV design. Other applications supporting Aviation Safety and Exploration programs have also been accelerated. Details will be in the final report.
30	2005	Customer Results	Service Accessibility	Access	Availability - System Availability	50% system availability - HECC focuses on ensuring that the computational engines are available on a 7x24 basis and that the resources are available to scientists and engineers 95% of the available time.	60% system availability	As of 8/8/2005, the system availability of Columbia exceeds 83%.
31	2006	Customer Results	Service Accessibility	Access	Availability - System Availability	60% system availability	75% system availability	As of June 2006, the average system availability for Coumbia is 94%.
32	2007	Customer Results	Service Accessibility	Access	Availability - System Availability	Exceeds 75%.	90%.	TBD
33	2005	Processes and Activities	Productivity and Efficiency	Productivity	Productivity - Accomplishments in Science and Development	Qualitative - impact measured by ability to enable new science and discovery. HECC enables scientific discovery by deploying vital computational resources and teaming scientists & computer engineers to focus on advances in specific science areas.	Annual Report (including accomplishments)	An Annual Report that summarizes the accomplishments under HECC is being prepared and will be available in September 2005.
34	2006	Processes and Activities	Productivity and Efficiency	Productivity	Productivity - Accomplishments in Science and Development	Qualitative	Annual Report (including accomplishments)	An Annual Report that summarizes the accomplishments under the NASA SCAP Program, including the HECC project, is being prepared and will be available in October 2006.

35	2005	Technology	Financial (Technology)	Overall Costs	Overall Costs - Cost per CPU Hour	96cents per CPU-hour for SGI Origin 3000 with 400 Mhz Clock. HECC attempts to reduce costs yet maintaining service levels. This exhibit describes procurement of a resource that decreases cost/hour and increases capacity and capability for users	Reduce the overall cost by factor of 5	In May 2005, the cost per normalized CPU hour was reduced by a factor of 11.7, more than double the standard.
36	2005	Technology	Efficiency	Response Time	Response Time - Time to Solution	Application Dependent	Improve the time to solution by a factor of 2	Factor of 15 or better. Time-to-solution for RTF Aerothermal analysis performance improvement: single solution reduced from 3 weeks to one day; ran more than 100 solutions in a 24 hour period.
37	2005	Technology	Reliability and Availability	Availability	Availability - System Availability	50% system availability - HECC focuses on ensuring that the computational engines are available on a 7x24 basis and that the resources are available to scientists and engineers 95% of the available time.	60% system availability	As of 8/8/2005, the system availability of Columbia exceeds 83%.
38	2006	Technology	Reliability and Availability	Availability	Availability - System Availability	60% system availability	75% system availability	As of June 2006, the average system availability for Columbia is 94%.
39	2006	Technology	Reliability and Availability	Availability	Reliability - System MTBF (Mean Time Between Failures)	New System (no baseline)	14 Days MTBF on 512 Processor Systems. Consider new baseline for 08.	From 07/012005 to 06/30/2006 (a one year period), the MTBF on 512 processor systems averaged 16.2 days, meeting the required standard.
40	2007	Technology	Reliability and Availability	Availability	Reliability - System MTBF (Mean Time Between Failures)	New System (no baseline)	14 Days MTBF on 512 Processor Systems	TBD

EA

Enterprise Architecture (EA)

In order to successfully address this area of the business case and capital asset plan you must ensure the investment is included in the agency's EA and Capital Planning and Investment Control (CPIC) process, and is mapped to and supports the FEA. You must also ensure the business case demonstrates the relationship between the investment and the business, performance, data, services, application, and technology layers of the agency's EA.

1. Is this investment included in your agency's target enterprise architecture?

Yes

1.a. If "no," please explain why?

2. Is this investment included in the agency's EA Transition Strategy?

Yes

2.a. If "yes," provide the investment name as identified in the Transition Strategy provided in the agency's most recent annual EA Assessment.

ARC Shared Capability Asset Program (SCAP) HECC MPIT, formerly the ARC High End Computing Columbia (HECC)

2.b. If "no," please explain why?

Service Reference Model

3. Identify the service components funded by this major IT investment (e.g., knowledge management, content management, customer relationship management, etc.). Provide this information in the format of the following table. For detailed guidance regarding components, please refer to http://www.whitehouse.gov/omb/egov/.

Component: Use existing SRM Components or identify as "NEW". A "NEW" component is one not already identified as a service component in the FEA SRM.

Reused Name and UPI: A reused component is one being funded by another investment, but being used by this investment. Rather than answer yes or no, identify the reused service component funded by the other investment and identify the other investment using the Unique Project Identifier (UPI) code from the OMB Ex 300 or Ex 53 submission.

Internal or External Reuse?: 'Internal' reuse is within an agency. For example, one agency within a department is reusing a service component provided by another agency within the same department. 'External' reuse is one agency within a department reusing a service component provided by another agency in another department. A good example of this is an E-Gov initiative service being reused by multiple organizations across the federal government.

Funding Percentage: Please provide the percentage of the BY requested funding amount used for each service component listed in the table. If external, provide the funding level transferred to another agency to pay for the service.

	Agency Component Name	Agency Component Description	Service Domain	Service Type	Component	Reused Component Name	Reused UPI	Internal or External Reuse?	Funding %

1	High-fidelity modeling & simulation	HECC users, but not the HECC itself, are Aerospace, Earth and physical scientists and engineers that use HECC platforms to run large numerical simulations of physical systems such as the Earth's atmosphere and oceans and physical models such as the Crew Exploration Vehicle. HECC purchases and administers systems that are specifically tuned for efficient processing of these models.	Business Analytical Services	Knowledge Discovery	Simulation			No Reuse	63.00
2	Knowledge and information discovery and sharing	HECC provides the network infrastructure and related services that promote knowledge and information discovery, retrieval, and sharing. HECC platforms and network services allow efficient sharing of large data sets across high performance network backbones and switches, web-accessibility to raw data, assimilated and modeled data sets, and intellectual capital. Although HECC users own the data, the HECC provides the infrastructure that allows the data to be stored, retrieved, and shared.	Digital Asset Services	Knowledge Management	Information Sharing			No Reuse	60.00
3	Archiving simulation results	The HECC mass storage subsystems have a total capacity exceeding 16 petabytes (PB) of storage. HECC provides hierarchical storage subsystems (tape silos, disks, servers, network infrastructure, and system software) that securely store and swiftly retrieve very large data sets. HECC is evolving its storage platforms using customized and commercial (e.g., SGI Data Migration Facility (DMF)) software products to serve the NASA engineering and research user communities better.	Back Office Services	Data Management	Loading and Archiving			No Reuse	26.00
4	Security measures	The HECC implements an approved security plan, security infrastructure, and deploys related tools for access to HEC resources and subsystems. A vulnerability assessment system utilizes security scanners to search for vulnerabilities, policy violations, and rogue network services. The HEC facility maintains 24x7 response capability and timely solution to security incidents.	Support Services	Security Management	Intrusion Detection			No Reuse	6.28

Technical Reference Model

4. To demonstrate how this major IT investment aligns with the FEA Technical Reference Model (TRM), please list the Service Areas, Categories, Standards, and Service Specifications supporting this IT investment.

FEA SRM Component: Service Components identified in the previous question should be entered in this column. Please enter multiple rows for FEA SRM Components supported by multiple TRM Service Specifications.

Service Specification: In the Service Specification field, Agencies should provide information on the specified technical standard or vendor product mapped to the FEA TRM Service Standard, including model or version numbers, as appropriate.

SRM Component	Service Area	Service Category	Service Standard
Simulation	Service Platform and Infrastructure	Delivery Servers	Application Servers
Simulation	Service Platform and Infrastructure	Software Engineering	Modeling
Simulation	Service Platform and Infrastructure	Hardware / Infrastructure	Servers / Computers
Simulation	Service Platform and Infrastructure	Hardware / Infrastructure	Peripherals
Simulation	Component Framework	Data Management	Reporting and Analysis
Information Sharing	Service Access and Delivery	Service Transport	Supporting Network Services
Information Sharing	Service Platform and Infrastructure	Delivery Servers	Web Servers
Information Sharing	Service Platform and Infrastructure	Hardware / Infrastructure	Wide Area Network (WAN)
Information Sharing	Service Platform and Infrastructure	Hardware / Infrastructure	Local Area Network (LAN)
Loading and Archiving	Service Platform and Infrastructure	Database / Storage	Storage
Loading and Archiving	Service Platform and Infrastructure	Database / Storage	Storage
Intrusion Detection	Service Access and Delivery	Service Requirements	Authentication / Single Sign-on
Intrusion Detection	Component Framework	Security	Supporting Security Services

5. Will the application leverage existing components and/or applications across the Government (i.e., FirstGov, Pay.Gov, etc)?

Yes

5.a. If "yes," please describe.

The HECC is not a stand-alone application, but a service that is being leveraged by others across the agency, and by other Federal and non-Federal partners. In particular, there exists an international community of research scientists and engineers that share diverse components and software applications, including both data and programs, across the Government and globally. Within the TRM component framework, under security, the HECC Program utilizes the Secure Sockets Layer (SSL) for certificates and/or digital signature. SSL is utilized for encrypted access to the Columbia supercomputer and operational support sub-systems such as computing and networking equipment. Furthermore, a two-factor identification is provided by SecureID. The HECC Program also maintains an intrusion prevention and detection system that consists of a vulnerability assessment system and a passive network monitoring system. The vulnerability assessment system utilizes two security scanners that probe and scan the network searching for vulnerabilities, policy violations, and rogue network services.

Within the TRM component framework, under data interchange, the HECC systems utilize standards-based local area and wide area networks. The network groups of individual institutions run the local area networks. Sample sites include; NASA ARC, NASA GSFC, Lawrence Berkeley National Labs, and MIT. From these sites, the local area networks interconnect with wide area networks (WANs), These WANs provide network transit between the local sites and the HECC Columbia supercomputer at NASA Ames.

The HECC Project's supercomputing environment provides the HEC capability and capacity that enables science and engineering modeling and simulation. The HECC users develop information products on the Columbia supercomputer; subsequently transfer these information products to their individual or project databases. As a result, within the TRM component framework, under

data management there is no database connectivity applicable to HECC users.. Within the TRM component framework, under data presentation / interface, the HECC Program provides project, computing system, network and security guidelines via displays. Within the TRM component framework, under business logic, the HECC systems have both platform independent and platform dependent software, protocols and methods.
6. Does this investment provide the public with access to a government automated information system?
No
6.a. If "yes," does customer access require specific software (e.g., a specific web browser version)?
6.a.1. If "yes," provide the specific product name(s) and version number(s) of the required software and the date when the public will be able to access this investment by any software (i.e. to ensure equitable and timely access of government information and services).

RISK

Risk Management

You should perform a risk assessment during the early planning and initial concept phase of the investment's life-cycle, develop a risk-adjusted life-cycle cost estimate and a plan to eliminate, mitigate or manage risk, and be actively managing risk throughout the investment's life-cycle.

Answer the following questions to describe how you are managing investment risks.

1. Does the investment have a Risk Management Plan?

Yes

1.a. If "yes," what is the date of the plan?

Jul 12, 2006

1.b. Has the Risk Management Plan been significantly changed since last year's submission to OMB?

No

1.c. If "yes," describe any significant changes:

n.a.

2. If there is currently no plan, will a plan be developed?

2.a. If "yes," what is the planned completion date?

2.b. If "no," what is the strategy for managing the risks?

3. Briefly describe how investment risks are reflected in the life cycle cost estimate and investment schedule: (O&M investments do NOT need to answer.)

A portion of the HECC budget is being used for development, modernization and enhancement during FY 2006-2008. When the investment involves extensive development activities, the cost estimates will be based on the best knowledge of the requirements and contingencies will be held commensurate with risk and uncertainty. In the analysis of alternatives approach to HECC, the risks have been taken into account in analyzing costs and making decisions on which approach to use.

COST & SCHEDULE

Cost and Schedule Performance

1. Does the earned value management system meet the criteria in ANSI/EIA Standard – 748?
Yes
2. Answer the following questions about current cumulative cost and schedule performance. The numbers reported below should reflect current actual information. (Per OMB requirements Cost/Schedule Performance information should include both Government and Contractor Costs):
2.a. What is the Planned Value (PV)?
100.500
2.b. What is the Earned Value (EV)?
97.500
2.c. What is the actual cost of work performed (AC)?
97.500
2.d. What costs are included in the reported Cost/Schedule Performance information?
Contractor and Government
2.e. "As of" date:
Jun 30, 2006
3. What is the calculated Schedule Performance Index (SPI= EV/PV)?
0.97
4. What is the schedule variance (SV = EV-PV)?
-3.000
5. What is the calculated Cost Performance Index (CPI = EV/AC)?
1.00
6. What is the cost variance (CV = EV–AC)?
0.000
7. Is the CV or SV greater than 10%?
No
7.a. If "yes," was it the CV or SV or both?
7.b. If "yes," explain the variance.
7.c. If "yes," what corrective actions are being taken?
7.d. What is most current "Estimate at Completion"?
394.108
8. Have any significant changes been made to the baseline during the past fiscal year?
No
8.a. If "yes," when was it approved by OMB?

Actual Performance against the Current Baseline

Complete the following table to compare actual performance against the current performance baseline and to the initial performance baseline. In the Current Baseline section, for all milestones listed, you should provide both the baseline and actual completion dates (e.g., "03/23/2003"/ "04/28/2004") and the baseline and actual total costs (in $ Millions).

	Description of Milestone	Initial End Date	Initial Total Cost ($mil)	Planned End Date	Actual End Date	Planned Total Cost ($mil)	Actual Total Cost ($mil)	Schedule Variance (# of days)	Cost Variance ($mil)	Percent Complete
1	FY04 Deploy 10,000p Simulation System	Sep 30, 2004	26.000	Sep 30, 2004	Sep 30, 2004	26.000	26.000	0	0.000	100.00
2	FY05 Upgrade 2,000p	Apr 1, 2005	2.000	Apr 1, 2005	Mar 4, 2005	2.000	2.000	-20	0.000	100.00
3	FY05 Begin upgrade 3 centers to 10Gb/sec	Jul 1, 2005	4.000	Jul 1, 2005	Jul 1, 2005	4.000	4.000	0	0.000	100.00
4	FY05 Complete upgrade 3 centers to 10Gb/sec	Jul 1, 2006	2.000	Sep 30, 2005	Sep 30, 2005	2.000	2.000	0	0.000	100.00
5	FY05 Deliver 65% System Avail and Integrated Simulation Environment	Sep 30, 2005	35.000	Sep 30, 2005	Sep 30, 2005	35.000	35.000	0	0.000	100.00
6	FY06 Upgrade 2,000p	Apr 1, 2006	2.000	Sep 30, 2006		0.000				0.00
7	FY06 Upgrade 3 centers to 10Gb/sec	Jul 1, 2006	4.000	Sep 30, 2006		0.000				0.00
8	FY06 Deliver 72% System Avail and Integrated Simulation Environment	Sep 30, 2006	37.000	Sep 30, 2006		37.782	28.500		-9.282	77.00
9	FY08 NASA Advanced Simulation Project	Sep 30, 2008	40.939	Sep 30, 2008		40.938				0.00
10	FY09 NASA Advanced Simulation Project	Sep 30, 2009	41.880	Sep 30, 2009		41.879				0.00

11	FY10 NASA Advanced Simulation Project	Sep 30, 2010	42.818	Sep 30, 2010		42.817				0.00
12	FY11 NASA Advanced Simulation Project	Sep 30, 2011	43.816	Sep 30, 2011		43.816				0.00
13	FY12 NASA Advanced Simulation Project	Sep 30, 2012	44.108	Sep 30, 2012		44.120				0.00
14	FY07 Acquire Columbia Follow-On (CFO) Hardware	Sep 30, 2007	11.627	Sep 30, 2007		11.627				0.00
15	FY07 NAS Facility Upgrades to support CFO	Sep 30, 2007	4.000	Sep 30, 2007		4.000				0.00
16	FY07 System S/W and Tools	Sep 30, 2007	9.102	Sep 30, 2007		9.102				0.00
17	FY07 Secure Operations, Security, and User Support	Sep 30, 2007	9.852	Sep 30, 2007		9.852				0.00
18	FY07 Improved Network Access to Columbia and CFO	Sep 30, 2007	4.407	Sep 30, 2007		4.407				0.00
19	FY13 NASA Advanced Simulation Project	Sep 30, 2013	44.620	Sep 30, 2013		44.620				0.00

			DME	Steady State	Total
Completion date: Current Baseline:	Sep 30, 2012	**Total cost: Current Baseline:**	394.108	9.852	403.960
Estimated completion date:	Sep 30, 2012	**Estimate at completion:**	394.108		403.960